Faculty of Engineering
Tanta University
Electronics and Electrical Comm. Dept.

كلية الهندسة
جامعة طنطا
قسم هندسة الإلكترونيات والإتصالات الكهربية

3rd year | **Final Exam** | **Second Term 2012-2013**

[85 Marks] | **Electromagnetic waves (2)** | **Code (EEC 3214)**

Time (3 hours), (Exam in two papers)

Answer the following five questions:

Question (1) [17 Marks]

a) **Prove** that the magnetic potential **A** is the like Fourier transform of the current distribution $I(z)$.

b) **Define** the following antenna parameters:
1. Radiated power density.
2. Average radiated power.
3. Radiation intensity.
4. Antenna directivity.
5. Antenna effective length.

Question (2) [17 Marks]

a) For short dipole antenna, **prove** that the magnetic potential A_z is given by

$$A_z = \frac{\mu}{4\pi}\frac{I_o L}{2}\left(\frac{e^{-jBr}}{r}\right) \quad \hat{z}$$

b) For short dipole antenna, **Find;**
1. The electric field component E_θ
2. The average radiated power $\bar{P}_{av}$
3. The total radiated power W_{rad}
4. Antenna effective length L_{eff}
5. Directivity.
6. Plot the E-plane and the H-plane patterns if the dipole antenna is oriented in Z-direction.

Question (3) [17 Marks]

a) If the general form of the magnitude of the electric field component of the long dipole is given by

$$|E_\theta| = 60\,\frac{I_m}{r}\left[\frac{\cos\left(\frac{\beta L}{2}\,cos\theta\right) - \cos(\frac{\beta L}{2})}{sin\theta}\right]$$

1. For $\lambda/2$ dipole antenna, ***prove*** that its directivity $D = 1.64$, and its effective area $A_{eff} = (0.13\lambda^2)\ m^2$, and determine its effective length L_{eff}.
2. Plot the E-plane and H-plane patterns of the $\lambda/2$ dipole antenna.

Question (4) [15 Marks]

a) Consider a travelling wave antenna (TWA) of length $L = 4\lambda$;
1. ***Plot*** the structure of the TWA.
2. ***Write*** the equation of the current distribution along the TWA.
3. Find the locations of ***nulls***, locations of ***peaks***, the ***relative amplitudes***, and ***plot*** the field pattern of the antenna.
4. Design the corresponding Rhombic antenna.
5. ***State*** the advantages and the disadvantages of the TWA.

Question (5) [19 Marks]

a) Explain the following modes of wave propagation:
1. The troposphere modes.
2. The ionosphere modes.

b) For direct wave propagation between a receiving antenna of height h_2 and a transmitting antenna of height h_1 separated by distance d.
1. Derive an expression for the total received electric field.
2. Plot the total field as function of angle θ and distance d.

c) For a microwave link operating over distance of 60Km using transmitting antenna of height $h_1 = 25\text{m}$.
1. Determine the minimum receiving antenna height required to achieve LOS propagation.
2. Determine the operating frequency that is required to operate in the stable region.

With my best wishes

Dr/ Amr Hussein

Electronics and Electrical Comm. Dept.
Total Marks: 85 Marks

Elective Course (3): Acoustic and Ultrasonic	
Course Code: EEC3221	Year: 3rd
Date: June , 11th 2013 (Second Term)	Allowed Time: 3 hrs
No. of Pages: (2)	

Question 1: **28Marks**

Check if the following statements are true or false and correct the wrong statements:

a) Frequencies below 16 Hz are called Ultrasonic

b) Loud speaker is electro acoustical transducer

c) Directivity index = 20 Log (directivity factor)

d) The diaphragm is made of paper as it is well damped

e) The reference value of sound energy density is 10 pJoule/m^3

f) The directivity factor of non spherical sound source is equal unity

g) The acoustic impedance is measured by Rayl

h) The range of audibility for undamaged human ear is from 16 Hz to 18 kHz

i) Surround used to connect voice coil to cone

j) Acoustic intensity is acoustic power transmitted per unit volume

k) Spherical sound source radiates sound wave uniformly in all directions from the source

l) The reference value of acoustic power = 1 Pwatt

m) The speed of sound is independent on the medium

n) If the frequency of sound signal is 250Hz, the wave number = 4.538 rad/m

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Question 2: **24 Marks**

a) Compare between Surround & Spider.

b) Explain with detailed graph the operation of Loudspeaker.

c) Explain the features of the diaphragm.

P.T.O

d) Write a short note about the following:

- Limited range driver
- Subwoofer
- Sound pressure
- Microphone
- Crossover
- Complete acoustic system
- Super tweeter
- Acoustic intensity level
- Woofer driver
- Midrange driver

Question 3: **18Marks**

a) State the main advantage of the main advantage of Enclosure.

b) Compare between different materials of diaphragm.

c) Explain with detailed graph between different types of Cross over.

d) Explain the full range driver with detailed graph.

Question 4: **15Marks**

a) Explain the types of Subwoofer

b) State the main applications of microphone in real world. (State 3 applications)

c) Explain with the detailed graph, the main idea of Dynamic Microphone's operation

d) State the two main applications for:

- full range driver
- limited range driver

---------- Good Luck, Dr Salah Khames ----------

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3rd year | **Final Exam** | **Second Term 2012-2013**
[75 Marks] | **Optical Communications** | **Code (EEC 3213)**

Time (3 hours), (Exam in two papers)

Answer the following five questions:

Question (1) **[15 Marks]**

(a) For a multimode fiber link where;

- The LED with its drive circuit has rise time of 15 ns, and spectral width of 60 nm.
- The material dispersion related rise time degradation is about 21 ns over $L = 6\ Km$ link.
- The receiver bandwidth is $B_{rx} = 25\ MHz$.
- The fiber has a bandwidth-distance product ($B_o = 400\ MHz.Km$) and q=0.7.

1. **Find** the rise time budget of the link.
2. Consider using RZ data format; **find** the maximum bit rate in (Mbps) that the optical link can support.

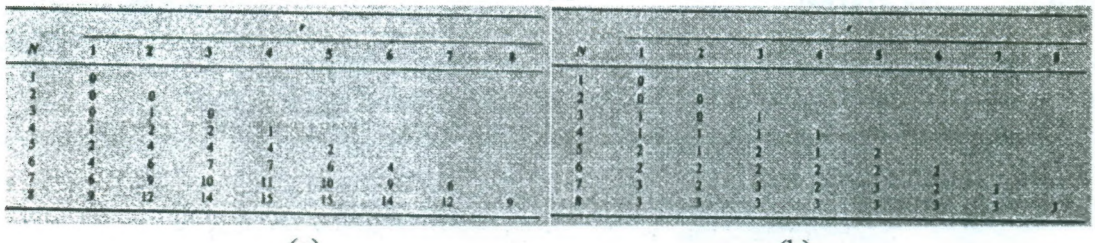
(b) **Briefly explain** the following;

1. Manchester line coding. **State** its advantages over the other line coding formats.
2. Reflection noise in optical system.
3. RIN noise.

Question (2) **[15 Marks]**

(a) For a multichannel amplitude modulation system if the number of multiplexed channels are 8. **Find:**

1. The number of the triple beat products.
2. The number of the two tone products.
3. The total number of the beat stacking products that fall on the 4th carrier.



(a) (b)

Distributions of the (a) third-order triple-beat and (b) two-tone IM products for the number of channels N ranging from 1 to 8

(b) Consider an SCM system having 120 channels, each modulated at 2.3 %. The link consists of 12 km of single mode fiber having a loss of 1 dB/km, plus a connector having a 0.5 dB loss on

each end. The laser source couples 2 mW of optical power into the fiber and has RIN = -135 dB/Hz. The pin photodiode receiver has a responsivity of 0.6 A/W, front face reflection coefficient of 0.3, bandwidth $B = 5GHz$, $I_D = 10$ nA, $R_{eq} = 50\Omega$, and $F_t = 3$ dB. Find the carrier-to-noise ratio of the system.

Question (3) **[15 Marks]**

(a) For a 2×2 silicon MZI multiplexer **derive** an expression for the waveguide length difference ΔL of the phase shifter.

(b) Consider a 16×16 single mode coupler made from a cascade of 3dB fused-fiber 2×2 couplers. Where 95% of the power is passed through each element. **Find:**

1. The number of the 3dB fused-fiber 2×2 couplers.
2. Excess loss and splitting loss.
3. Total loss.

Question (4) **[15 Marks]**

(a) **Explain** with drawing the external writing technique used to fabricate the Bragg reflection filter. In the external writing technique if a single ultraviolet ray incident from one side is used, **show** its effect on the fabricated filter.

(b) Consider a fiber grating filter with the following parameters: $L = 0.5cm$, $\lambda_{Bragg} = 1530nm$, $n_{eff} = 1.48$, $\delta_n = 2.5 \times 10^{-4}$, and $\eta = 82\%$. **Find:**

1. The coupling coefficient K.
2. The full bandwidth $\Delta\lambda$ over which the maximum reflectivity holds.
3. The maximum reflectivity R_{max}.

Question (5) **[15 Marks]**

(a) **Explain** with drawing the different optical network topologies.

(b) **State** the advantages of the wavelength division multiplexing WDM networks.

(c) Consider a simplex linear bus network consisting of $N = 5$ stations. Using the largest distance power budget:

1. Draw the network.
2. Derive the expression of the output power $P_{1,N}$ in terms of the input power P_o if the output power is taken from the final coupler fiber terminal.

With my best wishes

Dr/ Amr Hussein

	TANTA UNIVERSITY FACULTY OF ENGINEERING DEPARTMENT OF ELECTRONICS & ELECTRICAL COMMUNICATION EXAMINATION (*THIRD* YEAR)		
	COURSE TITLE: DIGITAL COMMUNICATION SYSTEMS		COURSE CODE: EEC 3220
DATE: 30/5/2013	TERM: SECOND	TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED: 3 HOURS

Answer the following questions

PROBLEM # ONE (20 mark)

State whether the following statements true or false, then verify your answer

a. PCM circuits are more complicated than delta modulation circuits.
b. COMPANDing is used to reduce signal to noise ratio in PCM system.
c. B8ZS is strongly suggested to be used in Local Area Network for long distances.
d. Flat top sampling is preferred to natural sampling from quantization point of view
e. M-ary modulation techniques are used to conserve bandwidth at the expense of increased power.
f. Probability of error in 16QAM is larger than that in 16PSK.
g. Coherent detection with matched filter is used in ASK detection when AWGN is large.
h. Pulse duration does not affect PAM bandwidth.
i. The PN code used in spread spectrum is independent on data sequence.
j. The superior performance of QAM can be realized if the channel is free of nonlinearities.

PROBLEM # TWO (22 mark)

I. Derive an expression for the power spectral density of polar NRZ format; hence deduce its advantages and disadvantages.
II. Discuss different types of noise occurs in PCM; hence discuss how to reduce them.
III. Consider a DM system designed to accommodate analog message signals limited to bandwidth 5 kHz. A sinusoidal test signal of amplitude A=1 volt and frequency 1kHz is applied to the system. The sampling rate of the system is 50 kHz. Calculate the step size required to minimize slope overload noise.

PROBLEM # THREE (26 mark)

I. Explain how Minimum shift keying is used to conserve FSK bandwidth.
II. Draw block diagram for both differential PCM and differential coding showing their main usage in communication systems.

III. Compare between bandwidth requirements for PAM, PCM, ASK, FSK, PSK, and DSSS systems.

PROBLEM # FOUR (22 mark)

I. A pseudo-noise (PN) sequence is generated using a feedback shift register of length r =4 with feedback connection [3,2]. The chip rate is 10^7 chips per second. Find:

a. The output PN code sequence.
b. PN sequence length.
c. Chip duration of PN sequence.
d. PN sequence period.

II. Draw block diagram of FH-SS transmitter and receiver and discuss what is its advantage over DSSS?

Good Luck,

Tanta University	Department of Electronics and Electrical Communication Engineering	Faculty of Engineering

Course: **Elective Course (2)** *[Digital Signal Processing and App.]*	Course Code: **EEC3218,**	Students: **3rd year**
Date: **Sun., 02-June-2013,**	Time Allowed: **Three hours,**	No. of Pages: **2,**

Final Exam (Total marks: 70)

Answer the following questions:

Q1: [15 Marks]

A system has:

$$H(z) = \frac{z^{-1} + z^{-2}}{(1 - 0.5z^{-1})(1 - 0.4z^{-1})(1 - 0.2z^{-1})}$$

a) Plot the poles and zeros in the z-plane and find the ROC (region of convergence)
b) Find the impulse response $h[n]$
c) Find the zero state step response
d) If the input is $2u[n]$, find the output $y[n]$ at $n = 1,2,3$
e) Realize this system using direct form I, II.

Q2: [20 Marks]

Design a band-pass filter around the following specifications:

Sampling frequency: $16\ KHz$.

Pass band: $0.3 - 3.4\ KHz$

a) Obtain a suitable transfer function and difference equation using the pole-zero placement
b) Use the bilinear Z-transform method to build the filter based on a second order prototype low pass filter. Obtain the transfer function and difference equation.
c) Implement the resulted transfer functions using the least memory elements for the two methods in a) and b).

Q3: [15 Marks]

Design a 13th order high pass digital filter using the FIR window method that should meet the following specifications:

Sampling frequency: $1\ KHz$

Stop band: $0.0 - 0.47\ KHz$

Pass band: $\geq 0.71\ KHz$

a) Sketch the ideal filter in frequency domain
b) Determine the appropriate window function from Table 1 and the expected main lobe to side lobe attenuation.
c) Calculate the filter coefficients
d) Implement the filter using the appropriate number of delays.

Q4: [10 Marks]

The poles and zeros of a digital filter are found to be: zeros at $z = \pm j$ and the poles are at $z = 1 \pm j$

a) Plot the pole-zero diagram
b) Find $H(z)$ and the difference equation
c) Calculate $|H(\omega)|$
d) Estimate the type of this filter

Q5: [10 Marks]

Find the impulse response and the transfer function to a system that is when excited by an input $x[n] = a^n u[n]$, it produces an output $y[n] = \frac{1}{a-b}\{a^{n+1}u[n] - b^{n+1}u[n]\}$. Check the stability, linearity, the time invariance properties for that system.

Table 1

Window function	Transition width (Hz) (normalized)	Pass-band ripples (dB)	Main lobe relative to side lobe (dB)	Stop-band attenuation (maximum) (dB)	Window function $w(n)$, $\lvert n\rvert \le \frac{N-1}{2}$
Rectangular	$0.9/N$	0.7416	13	21	1
Hanning	$3.1/N$	0.0546	31	44	$0.5 + 0.5\cos\left(\frac{2\pi n}{N}\right)$
Hamming	$3.3/N$	0.0194	41	53	$0.54 + 0.46\cos\left(\frac{2\pi n}{N}\right)$
Blackman	$5.5/N$	0.0017	57	75	$0.42 + 0.5\cos\left(\frac{2\pi n}{N-1}\right) + 0.08\cos\left(\frac{2\pi n}{N-1}\right)$

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With best wishes of success

Dr. Sameh A. Napoleon

Tanta University

Department: Electronics & Communications

Faculty of Engineering

Course Title: Microprocessors	**Course Code: EEC3215**
3th year	**Allowed time: 3 hrs**
Date: 9/6/2013	

Answer the following questions:

(Question 1) **(14 Marks)**

a) How is the microcontroller used for the traffic light control application? Write an appropriate program to show its operation? (8 Marks)

b) What is the function of the following registers? (6 Marks)

SP register, TMOD register, TCON register, IP register, PSW register

(Question 2) **(16 Marks)**

a) Show the stack for the following code? Calculate the delay time of the DEALY subroutine for 8051 system of 11.0592 MHz? (4Marks)

```
000B    120300          LCALL DELAY
000E    80F0            SJMP BACK
.....
0300                    ORG 300H
0300                DEALY:
0302    7CEE            MOV R4, # EEH
0304    7DEE        SSS: MOV R5, #EEH
0306    DDFE        AGAIN: DJNZ R5, AGAIN
0308    DCFA            DJNZ R4, SSS
030A    22              RET
```

b) Compare in details between interrupt and polling techniques? Explain the steps of executing an interrupt? (7 Marks)

c) What is the alternate function of port 3 of 8051 Microcontroller? (5 Marks)

(Question 3) **(15 Marks)**

a) Write **an 8051 C program** to continuously get the status of 6 relays connected to port 3 (**from $p_{3.7}$ to $p_{3.2}$**) of 8051 microcontroller and output them on 6 servo motors connected to port 1 (**from $p_{1.0}$ to $p_{1.5}$**) Wait 0.15 sec before sending the data to the servo motors (assume that XTAL= 11.0592 MHz). Explain your solution? (8 Marks)

b) Write **an 8051 C program** to find the maximum value of the marks of 10 students stored at memory locations starting from 45H in data memory of 8051 controller.

(7 Marks)

(Question 4) **(15 Marks)**

a) Write **an 8051 C program** to continuously get data from P3.1 and send it to P0.3 while simultaneously creating 8 kHz square wave on P2.7. XTAL= 11.0592 MHz.

(8 Marks)

b) Write **an 8051 assembly** program to change the sorting order of an array of data (30 locations) starting at LOC1 from ascending order to descending order. Store the new array in memory starting from LOC2. (7 Marks)

(Question 5) **(15 Marks)**

(a) The counter/timer of the microcontroller is used to measure the speed of an object falling through a column of water. When the object passes an upper sensor the controller starts the counter from zero. When it passes the lower sensor, it stops the counter and reads its value. The microcontroller is clocked from a 1.024 MHz crystal oscillator, and the counter is required to increment every 1 ms. How should you design this application using 8051 Microcontroller? Write an appropriate program to achieve your design?

(8 Marks)

(b) Write **an 8051 assembly** program to read the P1.5 and P1.6 bits and issue an action on port 0 according to the following: (7 Marks)

P1.5	P1.6	P0
0	0	Invert bit 3
0	1	Output '4'
1	0	reset bit 6
1	1	Turn on the light connected to P3.2 if P2.2 is 1

Good Luck

Dr. Ahmed Elmogy